

CLAIMS

I Claim:

- 5        1. A gas flow control system for a semiconductor processing unit comprising:  
         a first mass flow controller located at a first location;  
         a support structure located at said semiconductor processing unit;  
10        a gas manifold located at said support structure;  
         and  
         a first gas manifold inlet valve located at said support structure and coupled between said gas manifold and said first mass flow controller, wherein said gas manifold and said first gas manifold inlet valve are  
15        located at a second location separate and removed from said first location.
- 20        2. The system of Claim 1 further comprising a first gas manifold exhaust valve coupled between said first mass flow controller and an exhaust.
- 25        3. The system of Claim 1 further comprising:  
         a second mass flow controller located at said first location; and  
         a second gas manifold inlet valve located at said second location, said second gas manifold inlet valve being coupled between said second mass flow controller and said gas manifold.
- 30        4. The system of Claim 3 further comprising a first gas manifold exhaust valve coupled between said first mass flow controller and an exhaust.
- 35        5. The system of Claim 4 further comprising a

second gas manifold exhaust valve coupled between said second mass flow controller and said exhaust.

6. The system of Claim 1 wherein said semiconductor processing unit comprises a reactor, wherein said gas manifold is coupled to one or more injector ports of said reactor.

7. The system of Claim 6 wherein said reactor is supported by said support structure.

8. The system of Claim 1 further comprising a gas cabinet, said first mass flow controller being located in said gas cabinet.

9. The system of Claim 1 further comprising a process gas source coupled to said first mass flow controller.

10. A system comprising:  
a gas manifold;  
a first process gas source;  
a first regulator coupled to said first process gas source;  
a first gas manifold inlet valve coupled between said first regulator and said gas manifold;  
a second process gas source;  
a second regulator coupled to said second process gas source; and  
a second gas manifold inlet valve coupled between said second regulator and said gas manifold.

11. The system of Claim 10 further comprising:  
a first gas manifold exhaust valve coupled between said first regulator and an exhaust; and

a second gas manifold exhaust valve coupled between said second regulator and said exhaust.

12. A method comprising:

- 5 opening a first gas manifold inlet valve coupled between a first regulator and a gas manifold;  
regulating a flow rate of a flow of a first process gas through said first gas manifold inlet valve to said gas manifold with said first regulator;  
10 opening a second gas manifold inlet valve coupled between a second regulator and said gas manifold; and  
regulating a flow rate of a flow of a second process gas through said second gas manifold inlet valve to said gas manifold with said second regulator,  
15 wherein said first process gas and said second process gas mix in said gas manifold.

13. The method of Claim 12 wherein said gas manifold is coupled to a reactor.

14. The method of Claim 13 wherein a mixture of said first process gas and said second process gas is supplied from said gas manifold to said reactor.

15. The method of Claim 14 further comprising forming a layer on a substrate in said reactor by contacting said gas mixture with said substrate.

16. The method of Claim 12 further comprising:  
30 opening a gas manifold exhaust valve coupled between a third regulator and an exhaust; and  
regulating a flow rate of a flow of a third process gas through said gas manifold exhaust valve to said exhaust with said third regulator.

26. The system of Claim 22 wherein said first gas source is a dopant gas source and wherein said second gas source is a carrier gas source.

5 14 27. The system of Claim 22 wherein said first regulator regulates a flow rate of a flow of a first gas from said first gas source and wherein said second regulator regulates a flow rate of a flow of a second gas from said second gas source.

10 15 28. The system of Claim 27 wherein said first regulator and said second regulator are mass flow controllers.

15 29. A method comprising:  
setting a first flow rate of a flow of a first gas to a mixer;

20 setting a second flow rate of a flow of a second gas to said mixer, wherein a first flow of a gas mixture comprising said first gas and said second gas exits said mixer, said first flow of said gas mixture having a third flow rate;

setting a fourth flow rate of a second flow of said gas mixture to a reactor.

25 30. The method of Claim 29 further comprising directing a third flow of said gas mixture to an exhaust, said third flow of said gas mixture having a fifth flow rate equal to a difference between said third flow rate and said second flow rate.

30 31. The method of Claim 29 wherein said first gas is a dopant gas and wherein said second gas is a carrier gas.

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17. The method of Claim 16 wherein said  
regulating a flow rate of a flow of a third process gas  
occurs during said regulating a flow rate of a flow of  
a first process gas and said regulating a flow rate of  
5 a flow of a second process gas.

18. The method of Claim 17 further comprising:  
closing said first gas manifold inlet valve and  
said second gas manifold inlet valve to stop said flow  
10 of said first process gas and said flow of said second  
process gas to said gas manifold; and  
redirecting said flow of said third process gas  
from said exhaust to said gas manifold.

19. The method of Claim 18 wherein said  
redirecting comprises;  
closing said gas manifold exhaust valve; and  
opening a third gas manifold inlet valve coupled  
between said third regulator and said gas manifold.

20. The method of Claim 12 wherein said first  
process gas is supplied from a first process gas source  
and wherein said second process gas is supplied from a  
second process gas source, said first process gas  
25 source and said second process gas source being in a  
gas cabinet, said first gas manifold inlet valve and  
said second gas manifold inlet valve being located at a  
support structure separate from said gas cabinet.

21. A method comprising:  
opening a first gas manifold inlet valve coupled  
between a first regulator and a gas manifold;  
regulating a flow rate of a flow of a first  
process gas through said first gas manifold inlet valve  
35 to said gas manifold with said first regulator;

opening a gas manifold exhaust valve coupled  
between a second regulator and an exhaust;

regulating a flow rate of a flow of a second  
process gas through said gas manifold exhaust valve to  
5 said exhaust with said second regulator, said  
regulating a flow rate of a flow of a second process  
gas occurring during said regulating a flow rate of a  
flow of a first process gas.

10 22. A system comprising:

a mixer;

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a first gas source coupled to an inlet port of  
said mixer;  
15 a second gas source coupled to said inlet port of  
said mixer;

a first regulator coupled between said inlet port  
of said mixer and said first gas source; and

a second regulator coupled between said inlet port  
of said mixer and said second gas source.

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23. The system of Claim 22 further comprising a  
third regulator coupled to an outlet port of said  
mixer.

24. The system of Claim 23 further comprising a  
25 check valve coupled to said outlet port of said mixer  
and to an exhaust.

25. The system of Claim 24 wherein a first flow  
30 of a process gas exits said mixer, wherein a second  
flow of said process gas passes through said third  
regulator, a difference between said first flow and  
said second flow being a third flow of said process gas  
which passes through said check valve.

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32. A method comprising:

setting a flow rate of a flow of a dopant gas to a mixer;

5        setting a flow rate of a flow of a carrier gas to said mixer, wherein said dopant gas and said carrier gas mix in said mixer to form a process gas which flows out of said mixer; and

10        setting a flow rate of a first flow of said process gas to a reactor, wherein a difference between said flow of said process gas out of said mixer and said first flow of said process to said reactor is excess process gas.

33. The method of Claim 32 further comprising  
15        sending said excess process gas to an exhaust past a check valve.

34. The method of Claim 33 wherein a flow of said excess process gas to said exhaust has a flow rate  
20        equal to a difference between a flow rate of said flow of said process gas out of said mixer and said flow rate of said first flow of said process gas to said reactor.